

We claim:

1. A process for polymerizing at least one olefinic monomer in a loop reactor at from 20 to 150°C, but 5 below the melting point of the polymer to be formed, and a pressure of from 5 to 100 bar, where the polymer formed is present in a suspension in a liquid or supercritical suspension medium and this suspension is circulated by means of an axial 10 pump, wherein the loop reactor comprises a cyclic reactor tube whose diameter varies by at least 10%, based on the predominant reactor tube diameter, and in which there is at least one widening and narrowing in a region other than that 15 of the axial pump.
2. A polymerization process as claimed in claim 1, wherein the polymerization is carried out at an average solids concentration in the reactor of 20 more than 53% by weight, based on the total mass of the contents of the reactor, in the case of continuous product discharge and at an average solids concentration in the reactor of more than 25 45% by weight, based on the total mass of the contents of the reactor, in the case of discontinuous product discharge.
3. A process as claimed in claim 1 or 2, wherein 30 there is an additional widening and narrowing of the reactor tube in the region of the axial pump.
4. A process as claimed in any of the preceding claims, wherein ethylene is used as monomer and at least one  $\alpha$ -olefin having from 3 to 8 carbon atoms 35 is used as comonomer.
5. A process as claimed in any of the preceding claims, wherein at least one olefinic monomer is

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fed in at at least 2 points along the reactor tube.

6. A process as claimed in any of the preceding 5 claims, wherein the polymer formed is discharged continuously from the reactor.
7. A process as claimed in any of the preceding 10 claims, wherein the polymerization is carried out at an ethylene concentration of at least 10 mol%, based on the suspension medium.
8. A process for polymerizing at least one olefinic 15 monomer in a loop reactor as claimed in any of the preceding claims, wherein the polymerization in this loop reactor is preceded or followed by at least one further polymerization step in a loop reactor or a gas-phase reactor.
9. A loop reactor for the polymerization of olefinic monomers which comprises a cyclic reactor tube and an axial pump for conveying the polymerization mixture, wherein the diameter of the cyclic reactor tube varies by at least 10%, based on the 25 predominant reactor tube diameter, and there is at least one widening and narrowing in a region other than that of the axial pump.
10. A loop reactor as claimed in claim 9, wherein 30 facilities for feeding monomers into the reactor tube are located at at least 2 points.